What is claimed is:

1. A phase change optical disc compatible with a recording beam and a reproducing beam, comprising:

a transparent substrate;

at least one first dielectric layer thinly formed on said transparent substrate;

a phase change recording layer which converts between the crystal phase and the amorphous phase by irradiation with the recording beam;

a reflective layer; and

a phase control layer disposed between said transparent substrate and said phase change recording layer, said phase control layer having two areas defined in a laser spot, the laser spot defined by where the reproducing beam is incident to said phase control layer;

wherein the irradiation with the reproducing beam of said phase control layer within the laser spot causes a phase difference that alters an optical path of the reproducing beam reflected from said phase change recording layer.

2. The phase change optical disc of claim 1, further comprising:

a second dielectric layer;

a third dielectric layer; and

a protective layer;

wherein said first dielectric layer, said phase control layer, said second dielectric layer, said phase change recording layer, said third dielectric layer, said reflective layer, and said protective layer are sequentially laminated on said transparent substrate.

3. The phase change optical disc of claim 2, further comprising a fourth dielectric layer disposed between said reflective layer and said protective layer.

4. The phase change optical disc of claim 3, wherein said phase control layer is formed of a phase change material which converts between the crystal phase and the amorphous phase or converts from the crystal phase of one structure to the crystal phase of another structure.

SUB A2

5. The phase change optical disc of claim 4, wherein said phase control layer is formed of a material selected from the group consisting essentially of the GeSbTe family, InSbTe family, AgInSb family, Au, and Ni.

6. The phase change optical disc of claim 3, wherein one of the two areas defined on said phase control layer has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that substantially has a minimum value of 0 degrees, and the other area has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that substantially has a maximum value of 180 degrees.

7. The phase change optical disc of claim 2, wherein said phase control layer is formed of a phase change material which reversibly converts between the crystal phase and the

amorphous phase or converts from the crystal phase of one structure to the crystal phase of another structure.

8. The phase change optical disc of claim 7, wherein said phase control layer is formed of a material selected from the group consisting essentially of the GeSbTe family, InSbTe family, AgInSb family, Au, and Ni.

9. The phase change optical disc of claim 2, wherein one of the two areas defined on said phase control layer has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that substantially has a minimum value of 0 degrees, and the other area has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that substantially has a maximum value of 180 degrees.

10. The phase change optical disc of claim 2, wherein each of said first, second, and third dielectric layers is formed of a material selected from the group consisting essentially of Al_2O_3, $ZnS\text{-}SiO_2$, Si_3N_4, SiO_2, MgF_2, NaF_2, LiF_2, CaF_2, and AlF_2.

11. The phase change optical disc of claim 2, wherein said phase change recording layer is formed of a material selected from the group consisting essentially of the GeSbTe family, InSbTe family, and the AgInSbTe family.

12. The phase change optical disc of claim 1, wherein said phase control layer is formed of a phase change material which reversibly converts between the crystal phase and the amorphous phase or converts from the crystal phase of one structure to a the crystal phase of another structure.

13. The phase change optical disc of claim 11, wherein the phase control layer is formed of a material selected from the group consisting essentially of the GeSbTe family, InSbTe family, AgInSb family, Au, and Ni.

14. The phase change optical disc of claim 1, wherein one of the two areas defined on said phase control layer has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that substantially has a minimum value of 0 degrees, and the other area has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that has a maximum value of 180 degrees.

15. The phase change optical disc of claim 1, wherein said phase change recording layer is formed of a material selected from the group consisting essentially of the GeSbTe family, InSbTe family, and the AgInSbTe family.

16. The phase change optical disc of claim 1, wherein each of said first, second, and third dielectric layers is formed of a material selected from the group consisting essentially of Al_2O_3, $ZnS\text{-}SiO_2$, Si_3N_4, SiO_2, MgF_2, NaF_2, LiF_2, CaF_2, and AlF_2.

17. The phase change optical disc of claim 1, wherein said reflective layer is formed of a material selected from the group consisting essentially of Al, Al-Ti, Cu, Au, and alloys of any of the above.

SUB A5

18. A phase change optical disc compatible with a recording beam and having multiple layers formed on a transparent substrate, the multiple layers including a reflective layer, comprising:

a phase change recording layer which converts between the crystal phase and the amorphous phase by irradiation with the recording beam; and

a phase control layer disposed between the transparent substrate and said phase change recording layer, said phase control layer having a plurality of areas defined in a laser spot, the laser spot defined by where the reproducing beam is incident to said phase control layer;

wherein the irradiation of the laser spot on said phase control layer with the reproducing beam causes a phase difference in the plurality of areas on said phase control layer that alters an optical path of the reproducing beam reflected from said phase change recording layer.

19. The phase change optical disc of claim 18, wherein a material that forms said phase control layer defines the plurality of areas based upon a temperature profile of the material during irradiation by the reproduction beam.

20. The phase change optical disc of claim 18, wherein the plurality of areas comprise at least one area that has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that substantially has a value of 0 degrees, and at least one other area which has a phase difference, which alters an optical path of the reproducing beam reflected from said phase change recording layer, that substantially which substantially has a value of 180 degrees.

Add A6